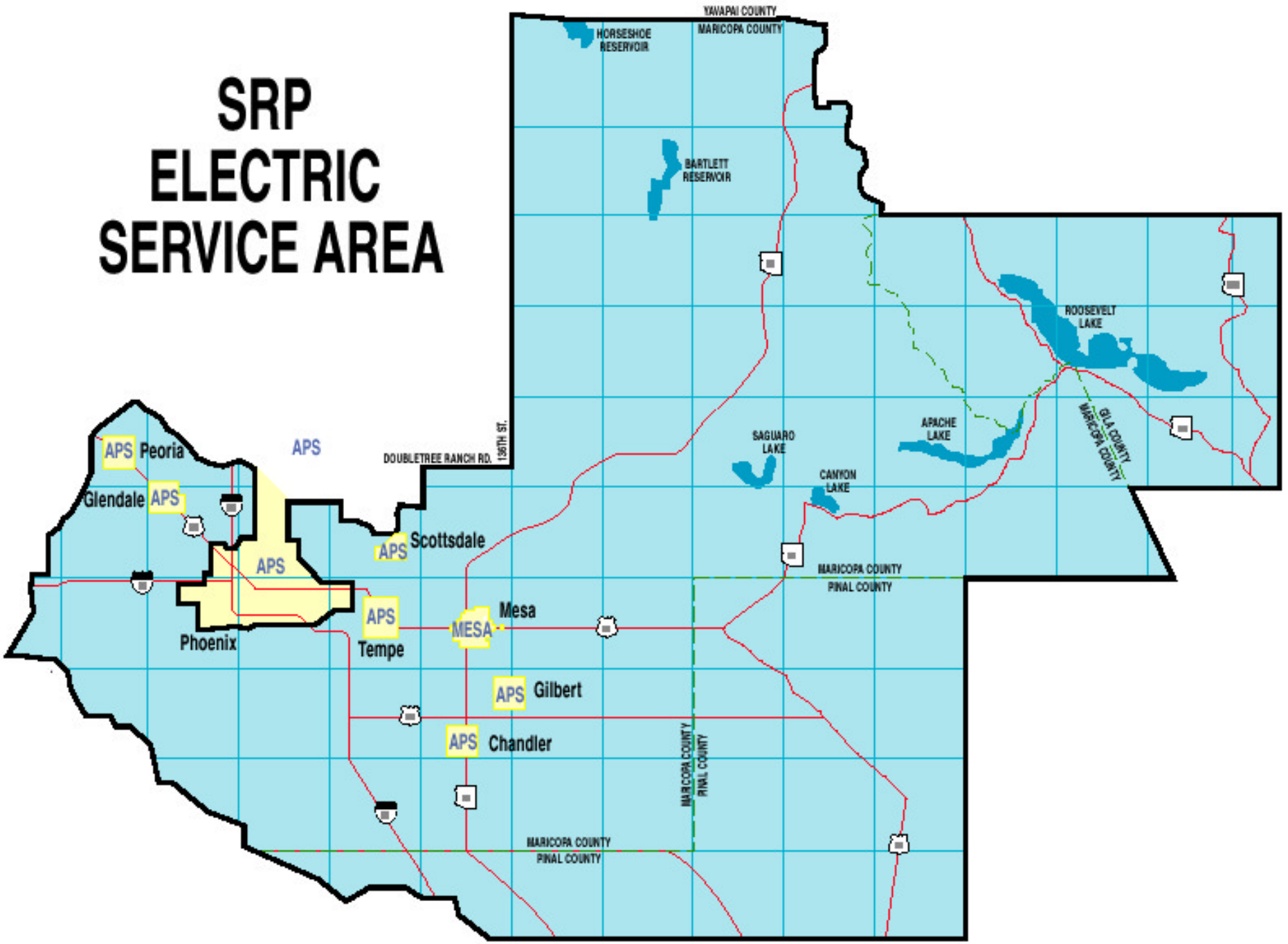
DOE Distributed Power & Industrial DG Quarterly Review Meeting

Increasing the Use of DG in the Semiconductor Industry

Subcontract # 400006029

July 10, 2002

Barry Cummings, SRP


SRP
ELECTRIC
SERVICE AREA
YAVAPAI COUNTY
MARICOPA COUNTY
HORSESHOE RESERVOIR
BARTLETT RESERVOIR
ROOSEVELT LAKE
APACHE LAKE
SAGUARO LAKE
CANYON LAKE
GILA COUNTY
MARICOPA COUNTY
DOUBLETREE RANCH RD.
136TH ST.
APS
Peoria
Glendale
Scottsdale
Phoenix
Tempe
MESA
Mesa
Gilbert
Chandler
MARICOPA COUNTY
PINAL COUNTY

Acknowledgement

- Joe Galdo, DOE/OPT Program Manager
- Tom Rizy, Technical Project Monitor
  Oak Ridge National Laboratory
- Phil Sarikas, Industry Advisor
  Intel Corporation

Status

- Final Report Draft Complete
- Peer Review in-process

Objectives

- Management decision guideline
- Research tool for site-specific, feasibility studies
- Estimated USA DER FAB market

Scope

- Focus on large 10 to 50 MW semiconductor FAB plants
- Evaluate economic, reliability, availability, and environmental issues and opportunities
- Evaluate potential multiple uses of DER to justify the investment

Final Report Outline

- Guidelines for Selecting a DER Project
- Environmental, Legal, and Institutional Issues
- Design Concepts
- Potential Market Impact
- Risk Assessment
- Conclusions/Results

Appendices

- Process Diagrams
- Electrical Single Line Diagrams
- General Arrangements
- Schedules

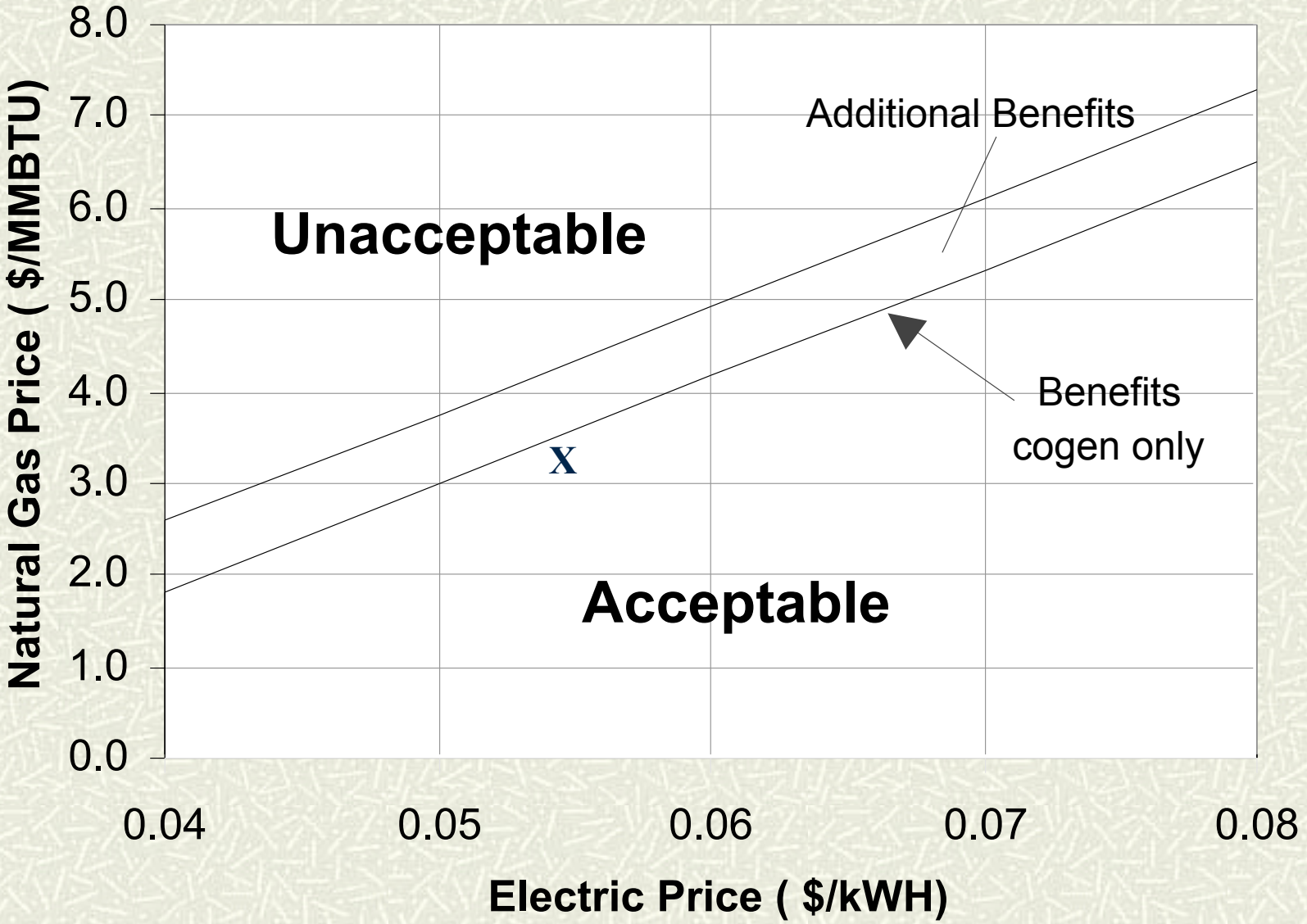
Conclusions

- Combustion Turbine only acceptable DER alternative
- By 2010, Fuel cells may acceptable.
- DER market penetration likely to be limited
- "Retrofit" existing FABS unlikely to occur
- Except fuel prices, risk will *not* be a major deterrent

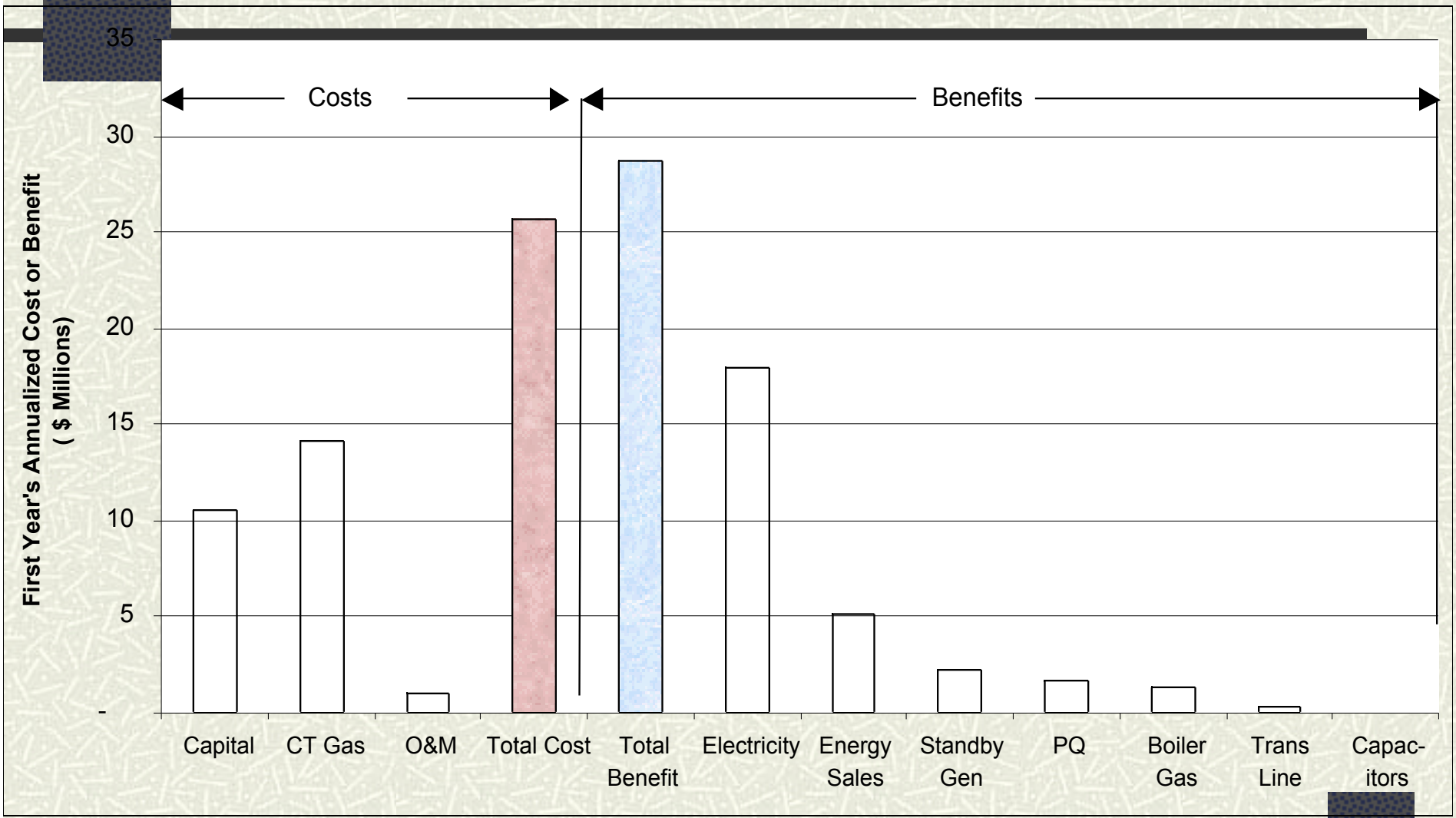
Two alternatives: One GE LM 6000 or Two GE LM 2500

	CASE							
	2A	2B	3A	3B	4A	4B	5A	5B
1-GE LM 6000	X	X	X	X				
2-GE LM 2500					X	X	X	X
Cogeneration	X	X	X	X	X	X	X	X
Combined Cycle	X	X			X	X		
Simple Cycle			X	X			X	X
Steam Turbine Chillers	X		X		X		X	
Absorption Chillers		X		X		X		X

Gas Price versus Electric Prices



Sources of Costs and Benefits



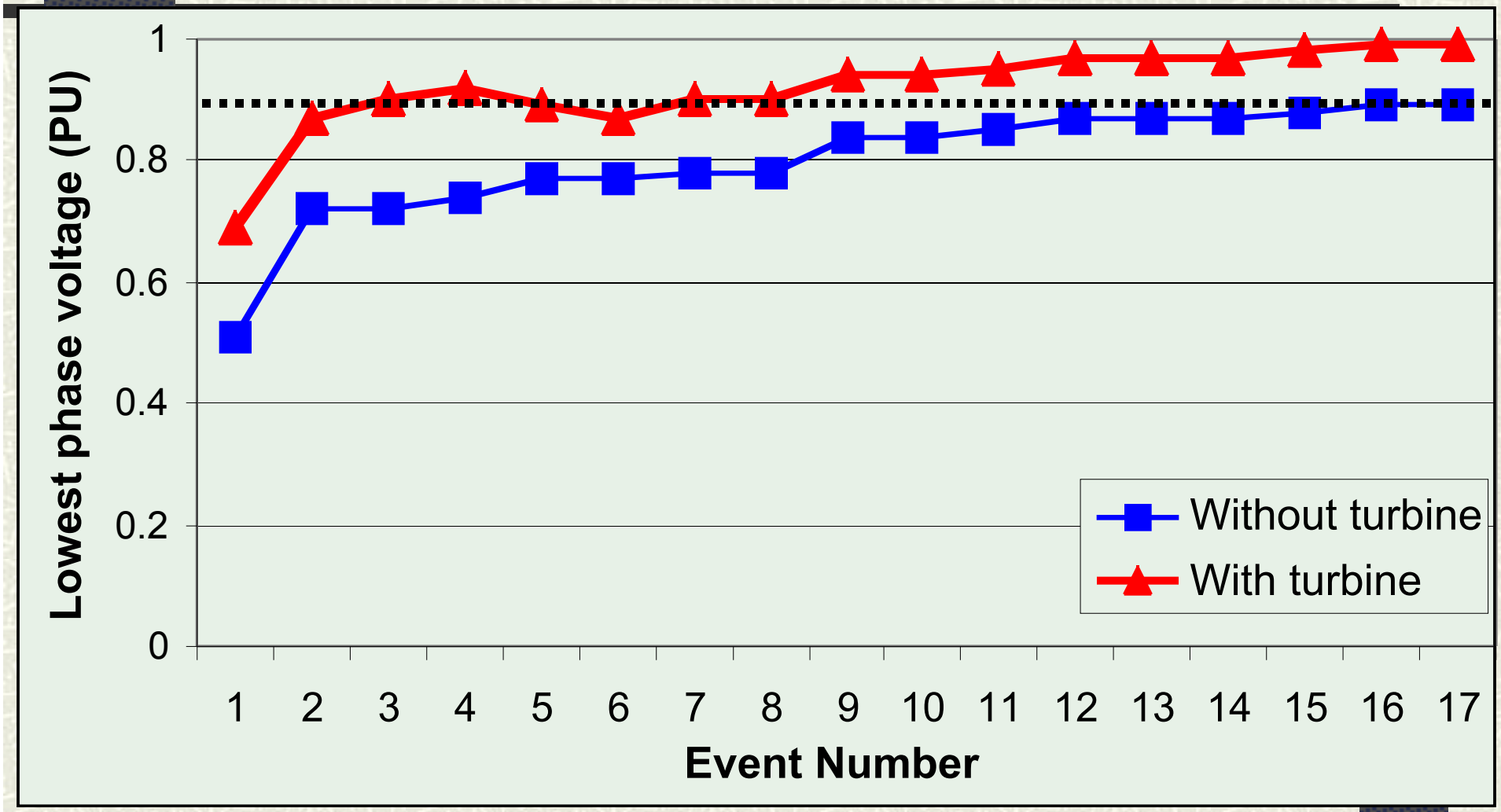
Economic Case Study Example

	Base Case	Combustion Turbine
Total Capital Cost	$65 million	$100 million
Net Present Value	Base	$15 million
Simple Payback	Base	4.0 years
Internal Rate of Return (IRR)	Base	28%

Economic Assumptions

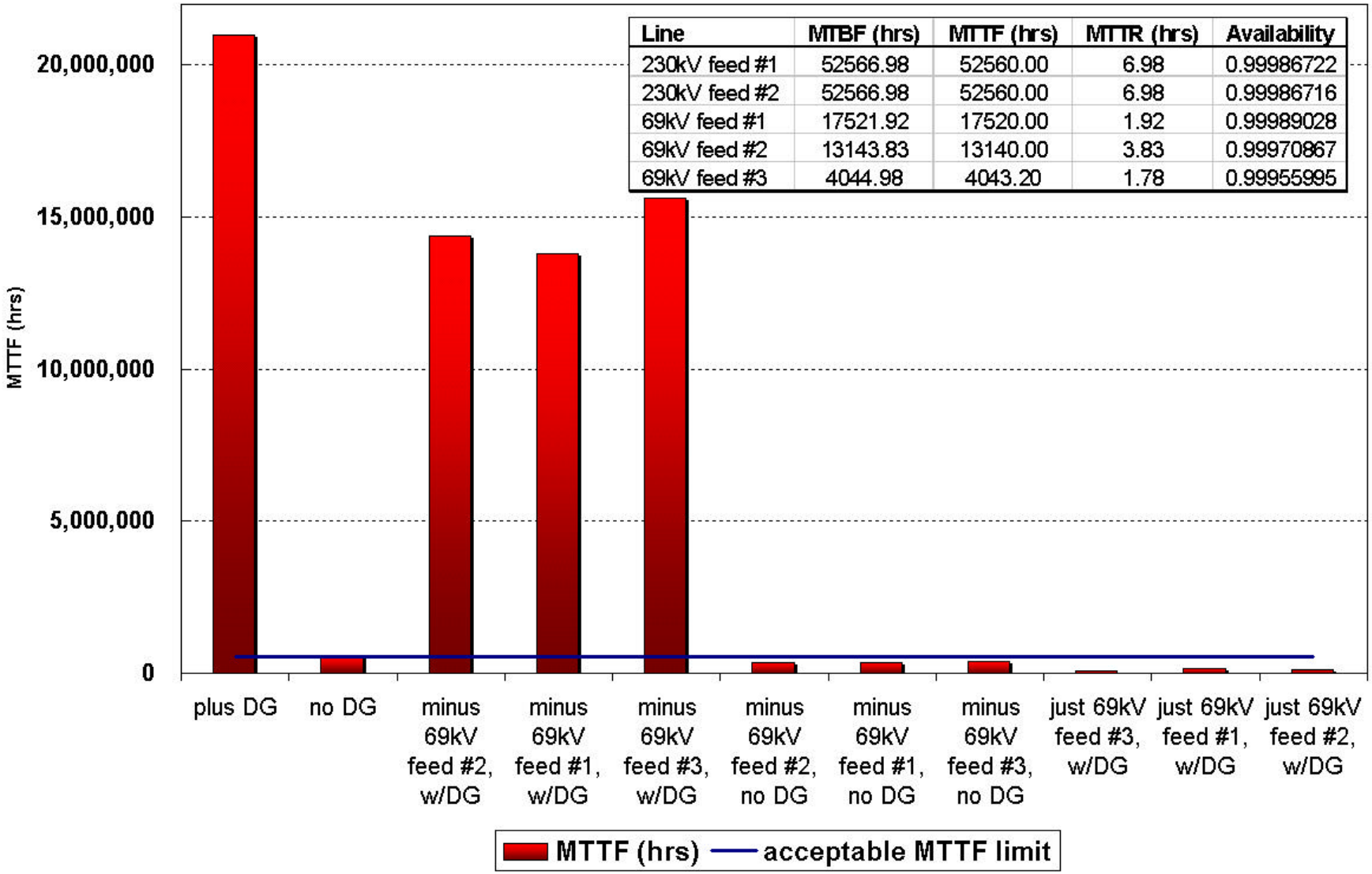
Variable	Value
Cost of capital	18%
Plant life	15 years
Grid supplied electricity	$0.055 / kWH
Natural gas	$3.50 / MMBTU
Excess electricity sales	$0.05 / kWH

Combustion Turbine effect on PQ sag event



Calculated MTTF as a function of various supply scenarios

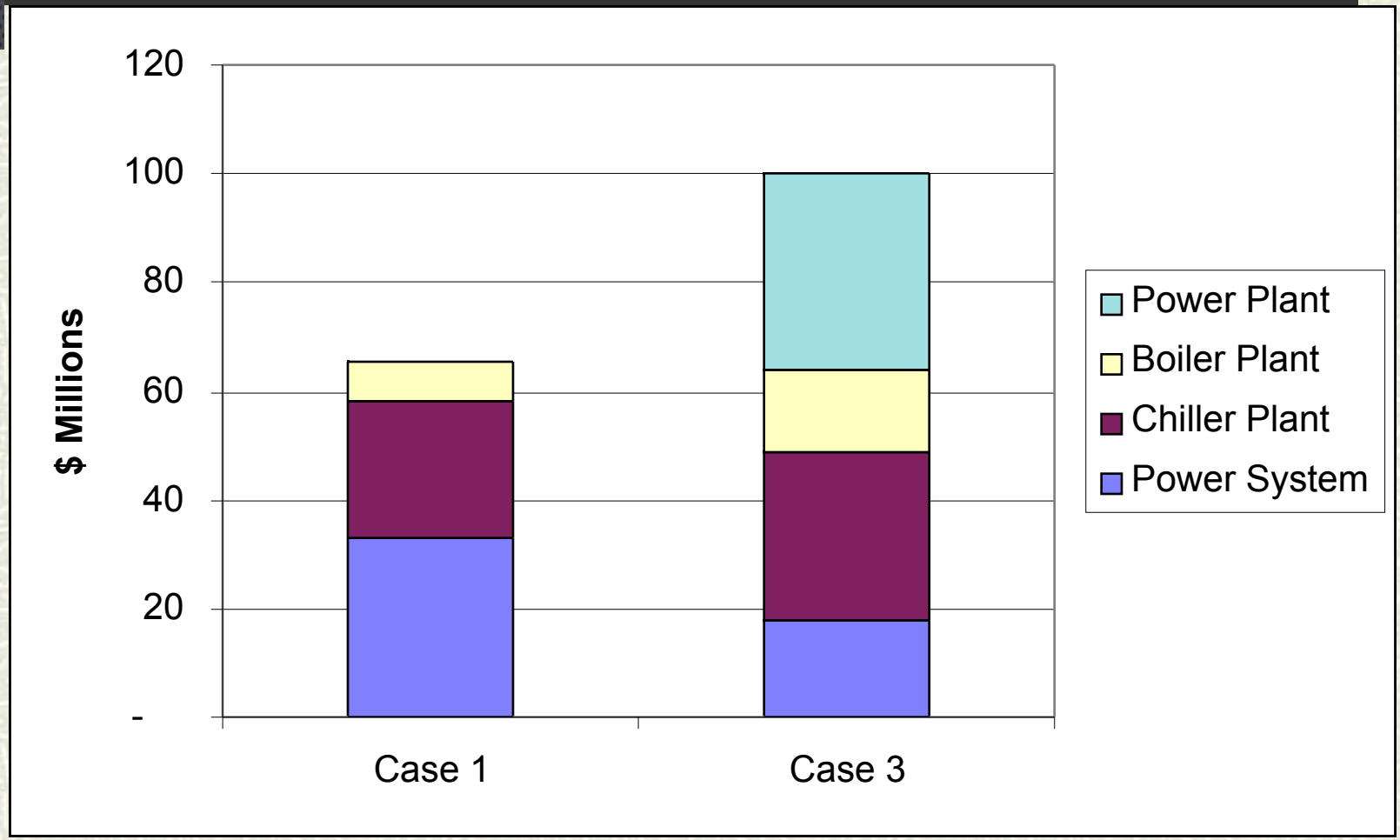
(base case = three 69kV sources, no DG)



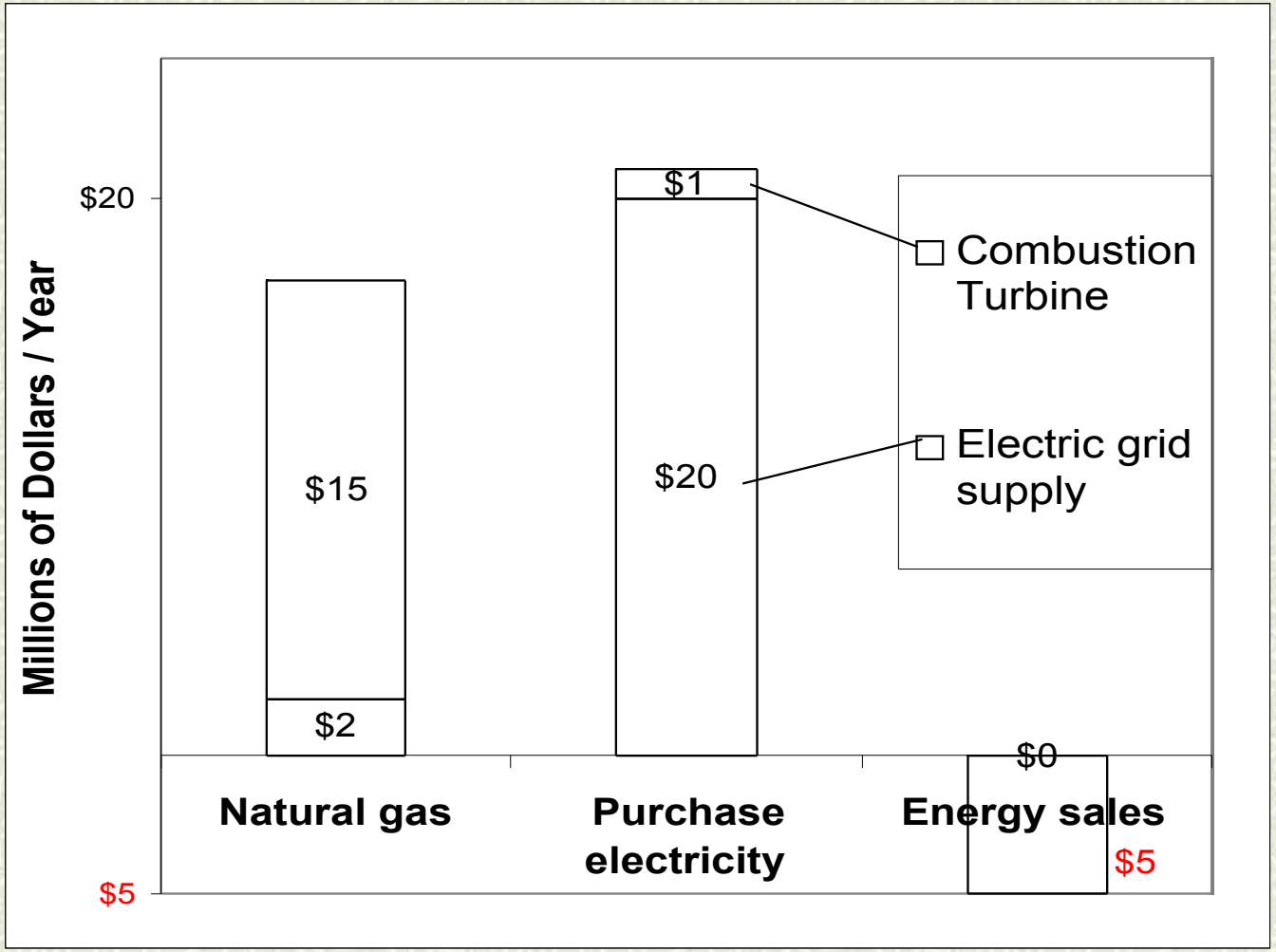
External Risk Conclusions

- Siting requirements for space and visual impact only be available at new FAB
- Public process and design alternatives likely to be successful
- Inspections and existing review processes will be challenge
- Size and emission levels unlikely a ‘major source’ issue.

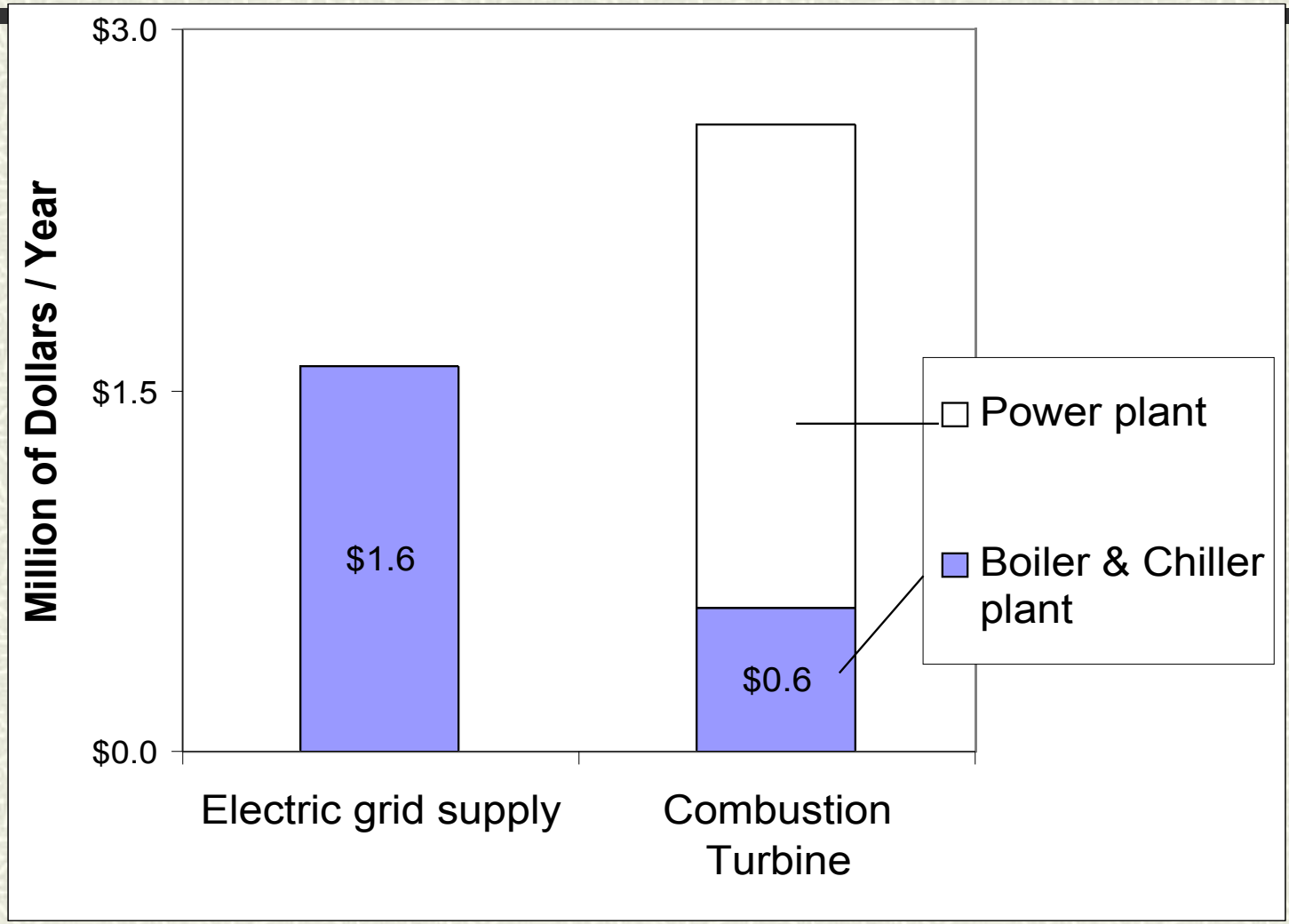
Capital cost differences

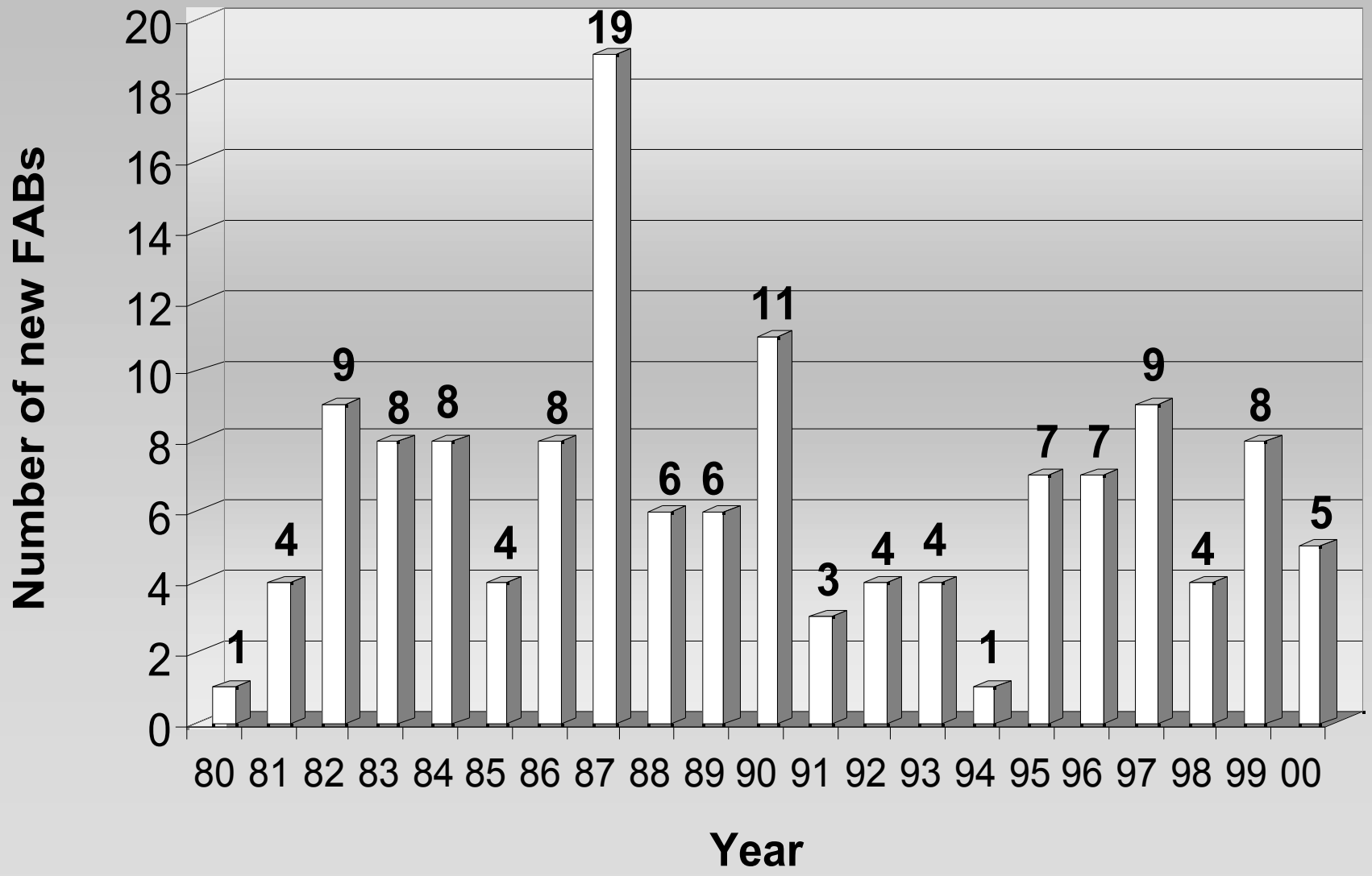


Energy annual cost differences



O&M annual cost differences




Number of New Fabs by Year
Number of new FABs
0
2
4
6
8
10
12
14
16
18
20
1
4
9
8
8
4
8
19
6
6
11
3
4
4
1
7
7
9
4
8
5
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00
Year

Forecast FABs by Wafer Size

	YEAR		
Wafer Size	2001	2002	2003
6 inches	2	2	1
8 inches	1	2	0
12 inches	2	2	5
Total	5	6	6

Marker Penetration Conclusion

Market Global Impact Minimal

- Number of DERs
- Air emission
- Natural gas usage

NOTE: Site specific impacts may be significant